

## Nanostructure of thin films grown by deposition of isotropically distributed gaseous particles at low temperatures

R. Alvarez<sup>1</sup>, P. Romero-Gomez<sup>1</sup>, J. Gil-Rostra<sup>1</sup>, J. Cotrino<sup>1,2</sup>, F. Yubero<sup>1</sup>, A. Palmero<sup>1</sup>,  
A.R. Gonzalez-Elipse<sup>1</sup>

<sup>1</sup>Instituto de Ciencia de Materiales de Sevilla, c/ Américo Vespucio 49, 41092 Seville, Spain

<sup>2</sup> Universidad de Sevilla, Departamento de Física Atómica, Molecular y Nuclear, Av. Reina Mercedes s/n, 41012 Seville, Spain

### Abstract.-

One of the most important factors that determine the formation of a given film microstructure is the angular distribution of the deposition flux. This distribution function strongly affects the surface shadowing mechanism, by which taller surface features inhibit the deposition of other particles under their shadow. In this work we theoretically and experimentally characterize the growth of amorphous thin films under the following constraints: i) the film temperature is low enough to inhibit surface diffusion and crystallization mechanisms [1], ii) the interaction plasma/film surface is weak during growth [2], and iii) the deposition flux follows an isotropic velocity distribution function in the gaseous phase before being deposited [3,4]. From an experimental point of view, we employed two different deposition techniques: Inverse magnetron sputtering (i-MS) deposition, which corresponds to a typical magnetron sputtering setup, but placing the film at the backside of the substrate holder (i.e., not facing the cathode), and plasma enhanced chemical vapor deposition (PECVD), by which we used volatile precursors in a downstream configuration. We have studied different amorphous TiO<sub>2</sub> and SiO<sub>2</sub> thin films deposited under the abovementioned conditions, finding that all of them share common microstructural features: all of them possess a coalescent column-like vertical microstructure, whose features are discussed through the experimental characterization of the films and the assistance of a Monte Carlo model of the growth.

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